

# WHITTINGTON'S DICTIONARY OF PLASTICS

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**Entropy.** A measure of the unavailable energy in a thermodynamic system, commonly expressed in terms of its changes on an arbitrary scale, the entropy of water at 32°F. being zero. The increase in entropy of a body is equal to the amount of heat absorbed divided by the absolute temperature of the body.

**Envenomation.** The process by which the surface of a plastic close to or in contact with another surface is deteriorated. Note: Softening, discoloration, mottling, crazing, or other effects may occur. (ASTM D 883-65T).

**Environmental Stress Cracking.** The formation of cracks or crazing caused by exposure of articles to certain chemicals and stresses. See also **STRESS CRACKING**, **CRAZING**.

**EP.** Abbreviation used by British Standards Institution for **EPOXY RESINS**, which see.

**EPDM.** Abbreviation for ethylene-propylene-diene terpolymers. See **ETHYLENE PROPYLENE RUBBERS**.

**EPI-.** (1) A prefix denoting an intramolecular bond or the presence of condensed double closed chain nucleus substituted in the 16 positions. (2) Abbreviation for **EPICHLOROHYDRIN**, which see.

**Epichlorohydrin.**  $\text{CH}_2\text{OCHCH}_2\text{Cl}$ . (chloropropylene oxide, EPI). A solvent for cellulosic and other resins, and one of the key reactants for epoxy resins as they were first made. It is highly reactive with polyhydric phenols such as bisphenol A.

**Epichlorohydrin Rubbers.** (CO, ECO). A group of elastomers comprising polymers and copolymers of epichlorohydrin, with good high temperature resistance, low temperature flexibility, and resistance to fuels, oils and ozone. The homopolymer (CO) is a saturated, aliphatic polyether with a chloromethyl side chain. The ECO type is a 1:1 mole copolymer of epichlorohydrin and ethylene oxide.

**EPM.** Abbreviation for ethylene-propylene copolymer. See **ETHYLENE PROPYLENE RUBBERS**.

**Epoxidation.** A chemical reaction in which an oxygen atom is joined to an olefinically unsaturated molecule to form a cyclic, three-membered ether. The products of epoxidation are known as *oxirane compounds* or **EPOXIDES**, which see.

**Epoxide Equivalent.** The weight of resin in grams which contains one gram equivalent of epoxy.

**Epoxides.** Compounds containing the oxirane structure, a three-membered ring containing two carbon atoms and one oxygen atom. The most important members are ethylene oxide and propylene oxide.

**Epoxy-.** (epoxy group, oxirane group). A prefix denoting an oxygen atom joined to each of two other atoms which are already united in some way, as in  $\text{-C-O-C-}$  or  $\text{-C-C-}$ .

**beta-(3,4-Epoxy-cyclohexyl) Ethyltrimethoxy Silane.** A silane coupling agent for reinforced polyester, epoxy, phenolic, melamine and many thermoplastics.

**Epoxy Foams.** Two basic types of epoxy foams are in use. Foamable powder compositions contain the resin, curing agent, blowing agent, wetting agent and an organic compound such as toluene to control the exothermic heat produced in curing. Liquid epoxy foam systems contain the same ingredients, but the curing agent is withheld until all other ingredients have been mixed, to be added just prior to casting. Liquid systems may also contain amine-terminated polyamide resins to impart resiliency to the foam. Epoxy foams are used in casting, potting and encapsulating of electrical components, insulating coatings for chemical storage tanks, and cores in laminates for aircraft and boats.

**Epoxy-Novolak Resins.** 2-step resins made by reacting epichlorohydrin with phenol formaldehyde condensates. They are also defined as linear, thermoplastic B-stage phenolic resins that are in a partial stage of cure. Whereas normal bisphenol-based epoxy resins contain up to two epoxy groups per molecule, the epoxy-novolaks may have seven or more such groups, producing a more tightly cross-linked structure in the cured resins. Thus, they are stronger and superior in many properties.

**Epoxy Plasticizers.** (epoxide plasticizers). A family of plasticizers obtained by the epoxidation of vegetable oils or fatty acids. The two main types are (a) epoxidized unsaturated triglycerides, e.g. soy bean oil; and (b) epoxidized esters of unsaturated fatty acids, e.g. oleic acid, or butyl-, octyl- or decyl esters. Most epoxy plasticizers have a heat-stabilizing effect, and they are often used for stabilization in conjunction with other stabilizers. Epoxidized oils in general have good extraction and migration resistant properties and low volatility, but they cannot be used as sole plasticizers in unfilled vinyl compounds and hence are not considered to be primary plasticizers. Certain epoxidized soybean oils have been FDA approved for food contact use.

**Epoxy Resins.** A family of thermosetting resins containing the group



Originally made by condensing epichlorohydrin and bisphenol A, epoxy resins are now more generally formed from low molecular weight diglycidyl ethers of bisphenol A and modifications thereof; or, as another type, by the oxidation of olefins with peracetic acid. Depending on molecular weight, the resins range from liquids to solid resins. The liquids, used for casting, potting, coating and adhesives, are cured with amines, polyamides, anhydrides or other catalysts. The solid resins are often modified with other resins and unsaturated fatty acids. Epoxy resins are also widely used in the reinforced plastics field, having good adhesion to glass fibers.

**Epoxy Stabilizers.** (epoxide stabilizers). Most **EPOXY PLASTICIZERS**, which see, also serve as stabilizers due to the ability of the epoxide group to accept hydrochloric acid, or, according to some authors, to serve as an intermediate in the presence of metallic salts in the conversion of hydrogen chloride to a metallic chloride. Epoxy stabilizers are most often used in conjunction with barium-cadmium and other stabilizers, with which they have a synergistic effect.

**EPR.** Abbreviation for **ETHYLENE PROPYLENE RUBBER**, which see.

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